

CLAIMS:

1. A data sonde for use in horizontal drilling, the data sonde comprising:
emitting means for emitting a first modulated signal from the data sonde, the first signal comprising zero and non-zero emission components in different periods; and
receiving means for receiving an intermittent second data signal during first signal zero emission periods.
- 2 A data sonde according to claim 1, wherein the emitting means is arranged to emit the first modulated signal at a first data rate and the receiving means is arranged to receive the second modulated signal at a second, higher, data rate.
3. A data sonde according to claim 1, wherein the emitting means is for emitting an electromagnetic signal.
4. A data sonde according to claim 1, wherein the receiving means is for receiving an electromagnetic signal.
5. A data sonde according to claim 1, wherein the receiving means is for receiving a signal from the power source of the sonde.
6. A data sonde according to claim 1, wherein the receiving means is for receiving data from a sensor system external to the sonde.
7. A data sonde according to claim 1, wherein the sonde is adapted to output at least part of data received by the receiving means in the signal emitted from the emitting means.

8. A data sonde according to claim 1, wherein the sonde is adapted to change operational mode on receiving instructions contained in the signal received at the receiving means.
9. A data sonde according to claim 1, wherein the emitting means is for emitting a radiative electromagnetic field.
10. A data sonde according to claim 1, wherein the receiving means is for receiving signals for upgrading software stored on the sonde.
11. A data sonde according to claim 1, wherein the data sonde further comprises:
power receiving means for receiving a power supply from either of at least one internal battery and an external power supply cable,
wherein the emitting means is also adapted to receive operative power from an external power supply when one is connected to the receiving means, and from a battery if no external power supply is connected to the receiving means.
12. A data sonde according to claim 11, further comprising control means for controlling the emitting means.
13. A data sonde according to claim 12, wherein the control means is for selectively energising the emitting means.
14. A data sonde according to claim 12, wherein the control means is for decoding signals received by the receiving means.
15. A data sonde according to claim 11, wherein the emitting means is for emitting a radiative signal and also for emitting a signal through the external power supply when one is connected to the sonde.

16. A method of bi-directional communication between a data sonde for use in horizontal drilling, and a device external to the sonde, the method comprising:
emitting a first modulated signal from the data sonde, the first signal comprising zero and non-zero emission components in different periods; and
receiving an intermittent second data signal during first signal zero emission periods.
17. A method according to claim 16, wherein the first modulated signal is at a first data rate and the second modulated signal is at a second, higher, data rate.
18. A method according to claim 16, wherein the emitting means emits an electromagnetic signal.
19. A method according to claim 16, wherein an electromagnetic signal is received.
20. A method according to claim 16, wherein a signal from the power source of the sonde is received.
21. A method according to claim 16, wherein data from a sensor system external to the sonde is received.
22. A method according to claim 16, wherein at least part of data received in the signal emitted from the emitting means is emitted in the emitted signal.
23. A method according to claim 16, wherein the sonde changes operational mode on receiving instructions contained in the signal received at the receiving means.
24. A method according to claim 16, wherein a radiative electromagnetic field is emitted.

25. A method according to claim 16, wherein signals for upgrading software stored on the sonde are received.
26. A method according to claim 16, wherein the data sonde is powered by either of at least one internal battery and an external power supply cable, and operative power is received from an external power supply when one is connected to the receiving means, and from a battery if no external power supply is connected.
27. A method according to claim 26, wherein the emission is periodic.
28. A method according to claim 26, wherein a radiative signal is emitted and a signal is also emitted though the external power supply when one is connected to the sonde.
29. A data sonde for use in horizontal drilling, the data sonde comprising:
an antenna;
a receiver; and
circuitry configured to control the antenna to emit a first modulated signal from the data sonde, the first signal comprising zero and non-zero emission components in different periods, and to control the receiver to receive an intermittent second data signal during first signal zero emission periods.
30. A data sonde according to claim 29, wherein the circuitry is adapted to control the antenna to emit the first modulated signal at a first data rate and to control the receiver to receive the second modulated signal at a second, higher, data rate.
31. A data sonde according to claim 29, wherein the antenna is adapted to emit an electromagnetic signal.
32. A data sonde according to claim 29, wherein the receiver is the antenna.

33. A data sonde according to claim 29, wherein the receiver is adapted to receive a signal from the power source of the sonde.
34. A data sonde according to claim 29, wherein the receiver is adapted to receive data from a sensor system external to the sonde.
35. A data sonde according to claim 29, wherein the sonde is adapted to output at least part of data received by the receiving means in the signal emitted from the antenna.
36. A data sonde according to claim 29, wherein the sonde is adapted to change operational mode on receiving instructions contained in the signal received at the receiver.
37. A data sonde according to claim 29, wherein the antenna is adapted to emit a radiative electromagnetic field.
38. A data sonde according to claim 29, wherein the circuitry is configured to decode signals comprising data to upgrade software stored on the sonde received by the receiver, and the sonde is adapted to so upgrade the software.
39. A data sonde according to claim 29, wherein the data sonde further comprises:
a power supply receiving unit to receive a power supply from either of at least one internal battery and an external power supply cable,
wherein the antenna is also adapted to receive operative power from an external power supply when one is connected to the power supply receiving unit, and from a battery if no external power supply is connected to the power supply receiving unit.
40. A data sonde according to claim 39, wherein the circuitry is configured to selectively energising the antenna.

41. A data sonde according to claim 39, wherein the circuitry is configured to decode signals received by the receiver.
42. A data sonde according to claim 39, wherein the antenna is adapted to emit a radiative signal, and also adapted to emit a signal though the external power supply when one is connected to the sonde.
43. A system for communicating between a data sonde and a remote apparatus, the system comprising:
an antenna;
a receiver;
circuitry configured to control the antenna to emit a first modulated signal from the data sonde, the first signal comprising zero and non-zero emission components in different periods, and to control the receiver to receive an intermittent second data signal during first signal zero emission periods,
a data sonde according to any one of claims 1 to 15 or 29 to 43; and
a sensor system magnetically coupled to the data sonde, the magnetic coupling providing a bi-directional communication channel between data sonde and sensor system.
44. A system for communicating between a data sonde and a remote apparatus, the system comprising:
an antenna;
a receiver;
circuitry configured to control the antenna to emit a first modulated signal from the data sonde, the first signal comprising zero and non-zero emission components in different periods, and to control the receiver to receive an intermittent second data signal during first signal zero emission periods,
a data sonde, and

a surface control unit physically coupled to the data sonde, the physical coupling providing a bi-directional communication channel between data sonde and surface control unit.